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Reading Rate and Reading Comprehension: A Comparison of Identified and Non-Identified Readers

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READING RATE AND READING COMPREHENSION:
A COMPARISON OF IDENTIFIED AND NON-IDENTIFIED READERS

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Abstract

Previous studies have supported the fact that reading rate is strongly correlated with reading comprehension for "normal" readers". However, few have studied this relationship for students experiencing difficulties in reading. If informal measures of reading ability such as CBM (Curriculum-Based Measurement) are to be used in determining eligibility for special education services or monitoring progress in a curriculum then the relationship between reading rate and reading comprehension should be determined.

The cross-validation of applied measures such as standardized tests of reading (i.e. Gates-McGinnitie) and informal measures such as CBM with theoretical models of reading development (such as those proposed by LaBerge and Samuels and Chall) may be useful in determining why reading rate and reading comprehension are correlated.

This study examined the relationship between Curriculum-based Measurement (CBM) reading rates and Gates-McGinnitie Reading Comprehension scores in both identified (students receiving Chapter I services) and non-identified readers.

Students from the age of seven to 12 years old were given the Gates-McGinnitie and CBM reading rate. Comparisons were made across age and identification groups.

Results indicated that both CBM and Gates-McGinnitie scores differentiated between identification groups with identified students obtaining lower reading rate and reading comprehension scores. It was also shown that age was a significant factor in reading rate with younger students reading slower than older students.

The correlation between reading rate and reading comprehension was stronger for non-identifed students than for identified students (with the exception of the nine-year-old group who demonstrated higher reading comprehension scores than reading rate).

Implications for cross-validation of the proposed reading models is discussed along with the advisability of using CBM reading rate as a reflection of reading comprehension for all students.

Introduction

Reading Rate and Reading Comprehension: Comparison of Identified and Non-Identified Readers

Curriculum-based measurement (CBM) is a standardized set of procedures which assess an individual student's achievement in the student's actual curriculum. Based on research by Stanley Deno and his colleagues at the University of Minnesota CBM developed partially in response to the growing concern that traditional standardized achievement tests were not sensitive to fundamental educational concerns. One such concern is if the student is demonstrating competence and growth in his/her present curriculum. Another concern is how an individual student compares to his/her peers who are being instructed in the same curriculum. Potentially CBM's utility could be in screening, identification, program planning and progress monitoring of such groups as the mildly handicapped (Tucker, 1985). For this puprose CBM has been developed to simply and efficiently address such educational issues (Deno, 1985) as well as be to be reliable and valid measures.

Oral reading rate is one area which is assessed with CBM. In developing an appropriate measure of reading

Deno and his colleagues recognized that comprehension is the desired goal of reading. Therefore, curriculum-based measures should be related to text comprehension. Deno, Mirkin, and Chiang (1982) sampled student performance on measures of oral reading of words from word lists, oral reading from basal text passages, saying the meanings of underlined words and supplying words deleted from a text passage (cloze procedure). These performances were then correlated with standardized achievement tests (Stanford Diagnostic Reading Test and Woodcock-Johnson). It was found that all tasks except the word-meaning tasks were highly correlated (correlations between .70 and .95) with the standardized norm-referenced tests (Stanford Diagnostic Reading Test and Woodcock-Johnson). Oral reading rates were also shown to increase with grade level and differentiate predictably between regular and LD students. Fuchs, Fuchs, and Maxwell (1988) also demonstrated that oral reading rate correlated highly with the Reading Comprehension subtest of the Stanford Achievement Test (a widely accepted standardized measure of reading comprehension).

Although research supports the fact that reading rate is strongly correlated with reading comprehension

it appears to lack the face validity which might lead to its greater acceptance and use (Potter & Wamre, 1990). If CBM measures are to be normed and used in a district's special education decisions, it is important that it be accepted as a valid and useful measure of reading comprehension. It has been suggested by Potter and Wamre (1990) that the cross-validation of CBM and well-accepted developmental reading models might be useful in establishing why simple reading rates are viable measures of reading skill and reading comprehension.

One developmental model of reading is that proposed by Chall (1983). Chall has developed a six-stage model of reading development which describes the normal process of the acquisition of reading. In Stage 0 (birth to age 6), print has minimal meaning for the child. The major emphasis is on gaining control of language. In Stage 1 (ages 6-7), initial reading or decoding skills are acquired in which a child learns the alphabet, sounds of letter and letter groups. The child is "glued to the print" and reading is generally quite slow. In Stage 2 (ages 7-8), the child practices skills acquired in Stage 1 and develops in fluency, use of context and speed. In Stage 3 (ages 9-14), the child uses reading to learn new information.

Whereas the younger child has "learned to read", the child in Stage 3 is now "reading to learn". Reading comprehension should, therefore, be better developed at this stage. Stages 4-6 show a progression into higher order thinking. Chall maintains that a disabled learner experiences difficulties in Stages 1 and 2 and often will not be able to progress into Stage 3.

Another developmental model of reading has been proposed by LaBerge and Samuels (1974). Based on the information processing perspective, these authors propose that as the decoding process becomes increasingly automatic the more energy there is available to devote to the task of comprehension. For a disabled reader who is still struggling with letter recognition and decoding skills, reading rate is slow and therefore not an automatic process. More energy must be devoted to the basic aspects of reading, such as decoding, and little is left for the mental energy needed to comprehend.

Several studies have provided empirical support to LaBerge and Samuels' and Chall's model (Stanovich, Cunningham, & West, 1981; McCormick & Samuels, 1979; Patberg, Dewitz, & Samuels, 1981). One of the common threads found in Challs' and LaBerge and Samuels'

developmental models of reading is that of decoding speed. A reader must be able to decode words rapidly and efficiently before being able to move on to more complex tasks such as comprehension.

Research which employs both the available applied research of CBM and the basic research (i.e. lab setting) of the developmental reading models could add to the construct validity of reading (Potter & Wamre, 1990). The research advantages are mutually beneficial. "Whereas CBM may prove a useful tool in testing reading models, these models can provide predictive hypotheses to be tested that lead to even more accurate uses of CBM, especially with students of different developmental levels." (Potter & Wamre, 1990).

The blending of applied and basic research is clearly needed. Some questions which could be addressed in this manner are as follows. Do disabled readers progress through Chall's stages in the same manner as normal readers (Chall, 1983)? Is the relationship between reading rate and comprehension the same for disabled readers as it is for normal readers (LaBerge & Samuels, 1974)? This research is intended to answer the two foregoing questions.

It was hypothesized that the two groups (identified and non-identified) would differ significantly in reading rate and reading comprehension scores. If Chall's model is valid it was expected that the identified readers would not show the growth seen in the non-identified readers between Stage 1 and Stage 2 (which should occur around age seven through age nine). A second hypothesis was that if reading rate is a valid measure of reading comprehension for identified readers then the correlation between CBM reading rates and reading comprehension scores should be positive and similar to those obtained for the non-identified readers.

Method

Subjects

Two hundred and two students from Area Education Agency (AEA 13) in Southwest Iowa served as subjects. Students were selected from two rural schools within the AEA 13 districts based on similarities in testing procedures. Specifically, these two schools routinely administer the Gates-McGinitie (1989) to their entire student population (kindergarten to sixth grade) in the fall and spring. Both schools were also involved in

the district-wide norming of their student population using CBM procedures. Therefore, both Gates-McGinnitie and CBM reading rate scores were available on the entire student population in both schools for the Spring of 1991.

Students who were currently receiving Chapter I services for reading difficulties and students who were receiving no special services were used for subjects. Chapter I students are identified for services based on performance on standardized tests such as the Iowa Test of Basic Skills or Gates-McGinnitie. Students need to generally fall below the 30th percentile in order to be considered for services.

Due to the smaller numbers of Chapter I students available in each school the entire sample of identified students was used. This yielded 101 students from the ages of seven and 12 who were receiving Chapter I services for reading under the State of Iowa guidelines for Chapter I services. The non-identified group was matched according to age and gender and were randomly chosen from all regular education students having the needed data. This provided an equal number of 101 "non-identified" students.

An equal number of identified and non-identified students were used at each age level although there were slight differences in the number of male and female students at each age group. In the seven-year-old group there were a total of 38 students with 19 identified (10 males and nine females) and 19 non-identified (10 males and nine females). There was a total of 32 eight-year-olds with 16 identified (eight males and eight females) and 16 non-identified (eight males and eight females). The nine-year-old group consisted of 38 students with 19 identified (nine males and 10 females) and 19 non-identifed (nine males and 10 females). Thirty-four ten-year-olds were utilzed, consisting of 17 identified (nine males and eight females) and 17 non-identified (nine males and eight females). There were 34 eleven-year-olds with 17 identified (10 males and seven females) and 17 non-identifed (10 males and seven females). The last group of 12-year-olds consisted of a total of 26 students with 13 identified (six males and seven females) and 13 non-identified (six males and seven females).

Materials and Procedure

The Gates-McGinitie (Reading Comprehension subtest) was utilized. The Gates-McGinitie is a group-

administered, norm-referenced test. The Reading Comprehension subtest requires a student to read a passage and answer questions concerning the content of the passage by choosing the correct response presented in a multiple choice format.

Curriculum-based measurement (CBM) reading rates which were administered in the spring of 1991 academic year were also used. As implemented in AEA 13 CBM reading rate consists of a student orally reading three passages obtained from the student's reading curriculum. This is administered individually and the student is allowed one minute to read each passage. The number of words read correctly is recorded and the median number of words read in considered that student's reading rate.

The principals in both schools were notified of the proposed research and both agreed to release the test data. All data were confidential and code numbers were assigned for each student. The Institutional review board (IRB) of the University of Nebraska at Omaha also granted its approval.

Design

A 2 (identified and non-identified) X 6 (age group) X 2 (gender) design was used with the two test scores

as a dependent measure.

Results

Both sets of data (CBM reading rate and Gate-McGinnitie Reading Comprehension scores) were first transformed into standard scores (T scores). This transformation was based on the mean and standard deviation of the full sample for each of the two reading measure, respectively.

Reading Comprehension

The first analysis was conducted on the Gates-McGinnitie reading comprehension scores. The main effect for Identification group was statistically significant, F (1,178) = 96.39, p <.001 (see Table 1) indicating that students identified with reading problems (X = 44.37) have poorer reading comprehension scores than non-identified students (X = 55.47). Although the main effect for Age was statistically significant, F (5, 178) = 3.05, p < .01 none of the multiple comparisons using the Tukey HSD procedure (see Table 2) reached statitical significance (p > .05 in each case). Neither the main effect for Gender nor any of the interaction effects were statistically significant (see Table 1).

Reading Rate

The analysis of the Reading Rate scores are summarized in Table 3. The main effect for Identification group was statistically significant, F (1,178) = 139.36, $p < .001$ indicating that students identified with reading problems (X = 44.88) have slower reading rates than non-identified students (X = 55.87). The main effect for Age was also statistically significant, F (5, 178) = 20.49, $p < .001$ (see Table 4). The Tukey HSD multiple comparison procedure was conducted on reading rate across the six age groups. These results showed that seven-year-olds were significantly slower readers than 12-year-olds F (1, 178) = 14.06, $p < .01$, 11-year-olds ($p < .05$), and 10-year-olds ($p < .05$). Eight-year-olds were also significantly slower readers than 12-year-olds ($p < .05$). No other differences were statistically significant ($p > .05$ in each case). See Table 4 for unweighted means.

Because the three-way interaction of Gender by Identification by Age, F (5, 178) = 3.85, $p < .01$ accounted for only 3.1% of the reading rate variance further analyses were not conducted.

Combined Analysis

An Analysis of Variance was performed that included both reading tests as a dependent variable. Only the Age X Test interaction was found to be statistically significant in this analysis, F (5,178) = 23.05, p < .001 (see Table 5). Statistical comparisons were made between the two test scores at each age group. It was found that significant differences occured at age 7, 8, 11 and 12 (Table 6). Specifically, it was demonstrated that as a group, the seven and eight-year-olds scored relatively higher on the reading comprehension than reading rate, while 11 and 12-year-olds scored relatively higher in reading rate than reading comprehension. Nine and ten-year-olds performed about the same in reading comprehension and reading rate.

The correlation between reading rate and Gates-McGinitie reading comprehension was then calculated for each group according to age (Table 7). Correlations for the identified group ranged from .06 to 49 with correlations for the non-identified group ranging from .32 to .64. Each correlation was then changed to a z value and a Fisher z test was calculated to determine the differences in these correlations. The resulting mean z value for identified students was .25 while the

mean z value for non-identified students was .48. A comparison of these two groups indicated non-significant differences when using all six age groups ($z = 1.59$, $p > .05$). However, a post-hoc analysis excluding nine-year-olds was shown to be statistically significant ($z = 1.94$, $p < .05$) indicating that with the exception of the nine-year-old group it was found that the correlation between reading rate and reading comprehension was different for identified and non-identified readers. Specifically, the relationship between reading rate and reading comprehension was shown to be weaker for identified students than non-identified students (Graph 1).

A Fisher z-test was then conducted to determine if a statistical difference existed between correlations at each age level (see Table 8). The results indicated that at every age level the relationship between reading rate and reading comprehension was essentially the same ($p > .05$ in each case).

Table 1

2 (Identification) X 2 (Gender) X 6 (Age) Analysis Conducted on Gates-McGinnitie Scores

Source	df	SS	MS	F	P
Identification	1	6071.61	6071.61	96.39	p <.001
Gender	1	20.06	20.06	.32	NS
Age	5	959.26	191.85	3.05	p < .01
Ident X Gend	1	11.51	11.51	.18	NS
Gender X Age	5	459.29	91.86	1.46	NS
Ident X Age	5	343.12	68.62	1.09	NS
Ident X Gend X Age	5	705.60	141.12	2.24	NS
Error	178	11211.83	62.99		

Table 2

Unweighted Means for Gates-MacGinitie Test Scores

Age	Mean in T Scores
7-0 to 7-11	52.04
8-0 to 8-11	52.90
9-0 to 9-11	50.83
10-0 to 10-11	49.31
11-0 to 11-11	46.72
12-0 to 12-11	47.71

Table 3

2 (Identification) X 2 (Gender) X 6 (Age) Analysis of Variance Conducted on Reading Rate

Source	df	SS	MS	F	P
Identification	1	5950.00	5950.00	139.36	p <.001
Gender	1	365.68	365.68	8.56	NS
Age	5	4373.21	874.64	20.49	p <.001
Ident X Gend	1	15.01	15.05	.35	NS
Gend X Age	5	73.41	14.68	.34	NS
Ident X Age	5	387.38	77.48	1.81	NS
Gend X Ident X Age	5	820.85	164.17	3.85	p < .01
Error	178	7599.89	42.70		

Table 4

Unweighted Means for Reading Rate

Age	Mean in T Scores
7-0 to 7-11	42.55
8-0 to 8-11	46.03
9-0 to 9-11	51.52
10-0 to 10-11	52.03
11-0 to 11-11	53.52
12-0 to 12-11	56.61

Table 5

2 (Identification) X 2 (Gender) X 6 (Age) Conducted on Both Tests (Reading Rate and Gates- McGinnitie

Source	df	SS	MS	F	P
Test	1	20.73	20.73	.54	NS
Gender X Test	1	107.22	107.22	2.82	NS
Ident X Test	1	.31	.31	.01	NS
Age X Test	5	4384.00	876.80	23.05	p<.001
Gend X Ident X Test	1	26.44	26.44	.70	NS
Gend X Age X Test	5	307.04	61.41	1.61	NS
Ident X Age X Test	5	109.91	21.98	.58	NS
Gend X Ident X Age X Test	5	308.49	61.70	1.62	NS
Error	178	6771.53	38.04		

Table 6

Analysis of Unweighted Means for Test Scores Across Age Groups (T Scores

Age	Gates-McGinnitie	Reading Rate	Significance
7-0 to 7-11	52.04	42.55	$p < .01$
8-0 to 8-11	52.90	46.03	$p < .05$
9-0 to 9-11	50.83	51.52	NS
10-0 to 10-11	49.31	52.03	NS
11-0 to 11-11	46.72	53.52	$p < .05$
12-0 to 12-11	47.71	56.61	$p < .01$

Table 7

Correlation of Reading Rate and Gates-McGinitie Reading Comprehension By Age and Identification

Age	Identified	Non-Identified
7-0 to 7-11	.14	.48
8-0 to 8-11	.06	.31
9-0 to 9-11	.50	.43
10-0 to 10-11	.27	.65
11-0 to 11-11	.23	.41
12-0 to 12-11	.26	.35

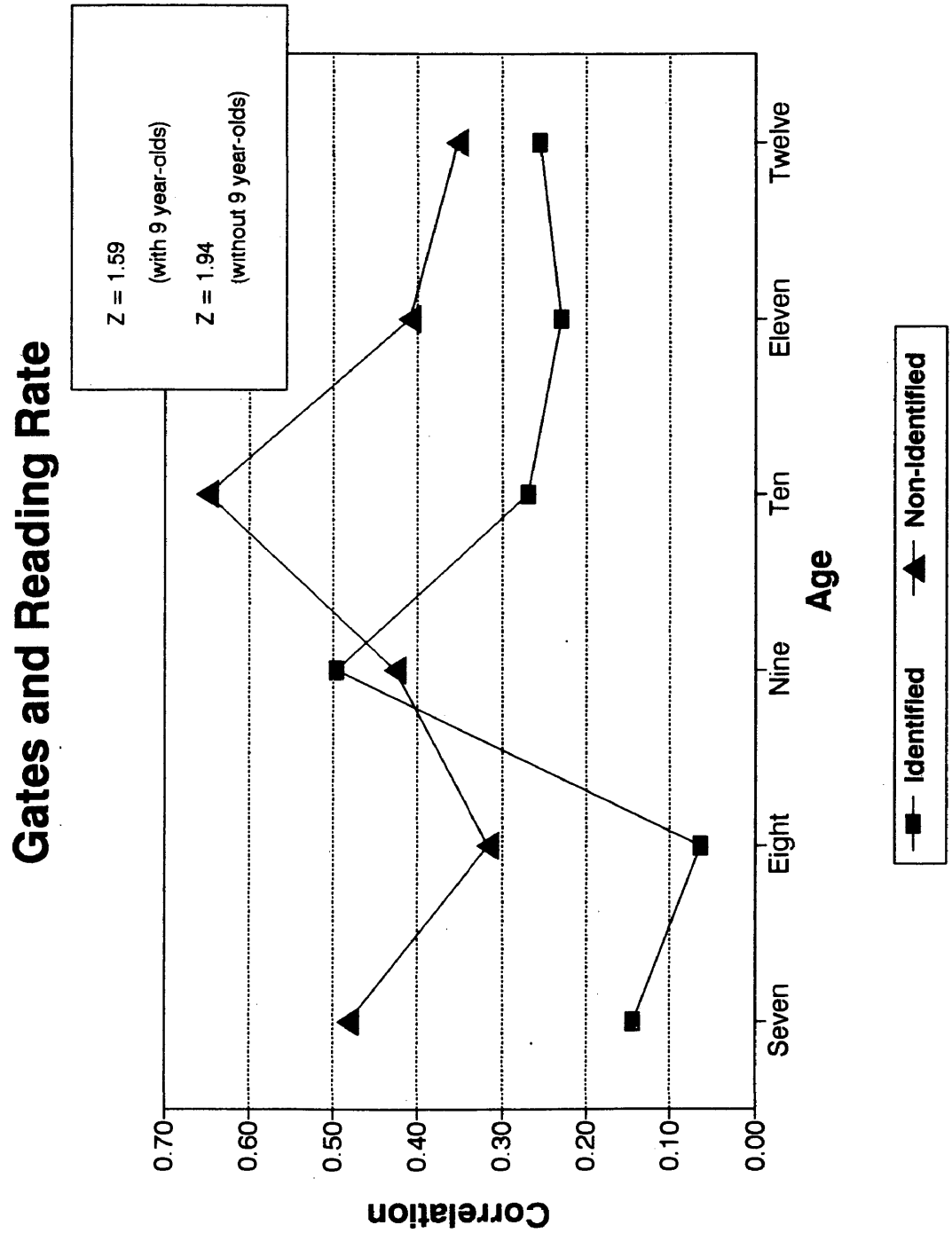
Table 8

Fisher z-test of Correlations

Age	z-test	
7-0 to 7-11	1.08	NS
8-0 to 8-11	0.67	NS
9-0 to 9-11	-0.25	NS
10-0 to 10-11	1.31	NS
11-0 to 11-11	0.53	NS
12-0 to 12-11	0.24	NS

*F crit. = 1.65

Graph 1


Gates and Reading Rate
Z = 1.59
(with 9 year-olds)
Z = 1.94
(without 9 year-olds)
Correlation
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Seven
Eight
Nine
Ten
Eleven
Twelve
Age
Identified
Non-Identified

Discussion

In summary this research demonstrated that oral reading rate increased with age and consistently differentiated between identified and non-identified students. This is similar to the findings of Deno, Mirkin, and Chiang (1982). Likewise, reading comprehension differentiated between identified and non-identified.

Chall's model of reading was validated on several levels. First of all reading rate was found to be signficantly slower at the younger ages (seven and eight year olds) at which time Chall described them as "glued to the print" (Chall, 1982). Reading comprehension was also significantly lower at these ages.

At age nine and 10 these students were essentially equivalent in reading rate and reading comprehension. This is consistent with Chall's reading model as he describes this age group as "reading to learn".

If Chall's model were to be a valid reflection of the acquisition of learning then the next age group (11 and 12 year olds) would be more proficient in both reading rate and reading comprehension. They should at the very least continue the linear progression evident

in the younger age groups. Contrary to this prediction this sample of students continued to improve in reading rate but not in reading comprehension (reading rate was significantly higher than reading comprehension for eleven and twelve-year-olds). In this case the ability to read more words per minute was not consistent with the ability to comprehend reading material as would have been predicted by the LaBerge and Samuels (1974) model.

The factors contributing to this finding are unknown at this time. However, it could be that this finding is peculiar to this sample of students. Perhaps the students who are in the Chapter I program at this time are more likely to experience reading difficulties specific to reading comprehension. It is also possible that the measure used (Gates-McGinnitie) is more difficult at older ages or measures other factors besides reading comprehension for older age readers.

Therefore, while this research supported the fact that both reading rate and reading comprehension accurately differentiate between students with reading difficulties it was unable to demonstrate that reading rate is a reliable correlate of reading comprehension across age groups. With the exception of the nine-year-

old group it was demonstrated that the relationship between reading rate and reading comprehension is different for identified and non-identified students. This would imply that caution should be used when using reading rate as a measure of general reading ability particularly for those students who are known to be experiencing reading difficulties.

Conclusions

This research attempted to combine applied and basic research in the area of reading. Since reading rate is used consistently in CBM procedures it is important that its function in reading assessment be determined. Previous researchers have demonstrated that a relationship between reading rate and reading comprehension does exist. However, this research failed to achieve such clear-cut results for all ages and identification groups included in this study.

One possibility is in the sample selection. By using a group of "mildly" disabled readers (those receiving Chapter I services) the results of this study may have been less clear. Future research efforts might focus on those students who have been identified as "learning disabled" in the area of reading. This would assure that these students have sufficient

reading difficulties which have led to assessment and identification as a special education student.

The design of this research may have influenced the results. A cross-sectional design assumes that the subjects across groups have essential variables in common. Perhaps a longitudinal or cross-sequential design would eliminate some of these potential difficulties.

It was assumed that the measures used were equivalent in difficulty across age groups. The fact that these measures were essentially unrelated in content could have influenced the results. Ideally, reading rate and reading comprehension should be obtained in the same content area (i.e. a student would first read a passage, reading rate measured and then asked a standard set of questions to assess comprehension; (see Fuchs, Fuchs and Maxwell, 1988).

Future research could provide answers to questions about the advisability of using reading rate as a measure of overall reading ability including reading comprehension. While this research did validate some factors of the reading models presented the relationship between reading rate and reading comprehension for identified and non-identified readers

at different age levels is unclear.

Recommendations

Curriculum-based measurement is becoming well-known in the educational field as a simple and efficient method of answering educational questions. These questions generally concern how a particular child is progressing in their current instructional material, how a particular child compares with their peers in that progress and whether this child may need remediation in a specific area. While CBM appears to be suited for that purpose certain cautions arise as a result of this particular research.

Both CBM reading rate and Gates-McGinnitie reading comprehension scores are indicators of reading abilty. However, from this research it would appear that caution should be used in making the assumption that CBM reading rates are valid indicators of reading comprehension for all groups of students. It is recommended that CBM reading rate be used as a screening or supplemental instrument when assessing a child's reading difficulties.

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